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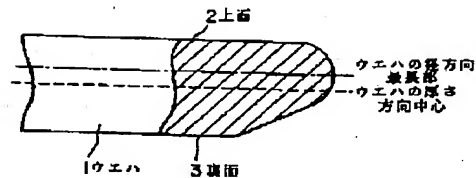
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(54) SEMICONDUCTOR WAFER

(57) Abstract:

PURPOSE: To prevent a semiconductor wafer from being damaged and broken in a process after the back of the semiconductor wafer has been ground so as to make the thickness of the semiconductor wafer thin.

CONSTITUTION: The shape on the side face at the outer circumferential end part of a semiconductor wafer 1 is formed in such a way that the longest part in the radial direction at the cross section perpendicular to the radial direction of the semiconductor wafer 1 becomes a round shape or a taper shape which exists at the lower part than the surface 2 of the semiconductor wafer and at the upper part than the center in the thickness direction of the semiconductor wafer.



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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Industrial Application] This invention relates to a semi-conductor wafer, and especially, in the process after carrying out grinding of the rear face of a semi-conductor wafer and making thickness of this semi-conductor wafer thin, a blemish is attached to the semi-conductor wafer concerned, or it relates to the semi-conductor wafer which prevented that a crack occurred.

**[0002]**

[Description of the Prior Art] From the former, the semi-conductor wafer for semiconductor devices cut down from the semiconducting crystal. In order to prevent the semi-conductor wafer concerned contacting various manufacturing installations etc., and getting damaged, or being cracked at the process which forms a desired component. Polish processing (rounding-off processing of a periphery edge side face) is performed with the polish fixture so that the configuration of this perpendicular direction edge of a path of a cross section may turn into the shape of a hemicycle describing one half of the  $R_s$  (R) of the thickness of the semi-conductor wafer concerned (configuration which became round) to the direction of a path of said semi-conductor wafer. That is, the periphery edge side face of a semi-conductor wafer serves as the round configuration where the thickness direction core of this semi-conductor wafer became a peak towards the direction of a periphery.

[0003] In recent years, thin film-ization of a semiconductor device has been required like detailed-izing of a semiconductor device, and high integration. Generally as one of the approaches which performs thin film-ization of this semiconductor device, the approach of making thickness of a semi-conductor wafer thin is performed. The approach of carrying out grinding of the rear face of the approach of starting by desired thin thickness, the approach of carrying out grinding of the rear face of the semi-conductor wafer for semiconductor devices cut down from the semiconducting crystal, and making this semi-conductor wafer desired thin thickness, or the semi-conductor wafer with which the desired component was formed, and making this semi-conductor wafer desired thin thickness as this approach, for example, in case a semi-conductor wafer is cut down from a semiconducting crystal etc. is mentioned.

[0004] However, when the approach of cutting down said semi-conductor wafer by desired thin thickness and the approach of carrying out grinding of the started rear face of a semi-conductor wafer, and making this semi-conductor wafer desired thin thickness formed a desired component in the semi-conductor wafer concerned at a next process, the problem of being easy to produce curvature was in this semi-conductor wafer. So, generally in recent years, the approach of assembling, carrying out grinding of the rear face of the semi-conductor wafer in front of a process, and making this semi-conductor wafer desired thin thickness by which the desired component was formed is performed.

[0005] And to the thin film chemically-modified [ of this semi-conductor wafer ] degree, grinding of the rear face of this semi-conductor wafer is usually performed after forming a request component until the thickness of the semi-conductor wafer concerned serves as or less  $1/2$  extent in front in an assembler.

**[0006]**

[Problem(s) to be Solved by the Invention] However, the conventional example to which said assembler does grinding of the rear face of a semi-conductor wafer in front, and adjusts thickness to it. Usually, since grinding is performed until the thickness of a semi-conductor wafer serves as or less  $1/2$  extent, the round configuration currently formed in the periphery edge side face of the semi-conductor wafer in front of said grinding collapses, and the inferior surface of tongue of a semi-conductor wafer serves as a configuration most projected towards the periphery among the periphery edge side faces of this semi-

conductor wafer. Therefore, since the angle which the inferior surface of tongue and periphery edge side face of a semi-conductor wafer after grinding form will be in an acute angle condition (condition in which the tip sharpened), in process [ the back ], this part contacts various equipments etc., and gets damaged, or is missing, or it was easy to be divided, and there was a problem that the yield fell.

[0007] This invention aims at offering the semi-conductor wafer which can prevent that a blemish is attached to the semi-conductor wafer concerned, or a crack occurs in the process after making to solve such a conventional trouble into a technical problem, carrying out grinding of the rear face of a semi-conductor wafer and making thickness of this semi-conductor wafer thin.

[0008]

[Means for Solving the Problem] In order to attain this purpose, this invention is start from a semiconducting crystal and offers the semi-conductor wafer with which the longest section of this path direction in a perpendicular cross section is characterize by exist the lower part [ top face / of this semi-conductor wafer ], and above the thickness direction core of this semi-conductor wafer to the direction of a path of said semi-conductor wafer in the semi-conductor wafer for semiconductor devices with which nolith processing was performed to the side face.

[0009]

[Function] Since the longest section of this path direction [ in / to the direction of a path of a semi-conductor wafer / in the semi-conductor wafer concerning this invention / a perpendicular cross section ] exists the lower part [ top face / of this semi-conductor wafer ], and above the thickness direction core of this semi-conductor wafer, Even if it carries out grinding of the rear face of this semi-conductor wafer until the thickness of the semi-conductor wafer concerned serves as or less 1/2 extent, the longest section of this path direction in a perpendicular cross section can be made to exist in the periphery edge side face of the semi-conductor wafer after grinding to the direction of a path of the semi-conductor wafer in front of said grinding. Therefore, there is nothing for which the angle which the inferior surface of tongue and periphery edge side face of a semi-conductor wafer after grinding form turns into an acute angle (configuration where the tip sharpened), and an acute angle configuration is not formed in the periphery edge side face concerned. For this reason, said semi-conductor wafer can prevent contacting various manufacturing installations etc., and getting damaged, or it being missing, or being divided.

[0010]

[Example] Next, the example concerning this invention is explained with reference to a drawing. Drawing 1 is the fragmentary sectional view of the semi-conductor wafer concerning the example of this invention. In the various processes performed behind, the semi-conductor wafer 1 shown in drawing 1 is equipped with the round configuration where the periphery edge side face of said semi-conductor wafer 1 was processed round, in order to prevent the semi-conductor wafer 1 concerned contacting a manufacturing installation etc., and getting damaged, or being cracked. The longest section of this path direction [ in / to the direction of a path of said semi-conductor wafer 1 / in this round configuration / a perpendicular cross section ] exists the lower part [ top face / 2 / of the semi-conductor wafer 1 concerned ], and above the thickness direction core of this semi-conductor wafer 1, and it has the unsymmetrical configuration to the thickness direction center line of the semi-conductor wafer 1.

[0011] It assumes that it carries out grinding of the rear face of the semi-conductor wafer 1 concerned, and makes thin thickness of this semi-conductor wafer 1 to or less 1/2 extent after this semi-conductor wafer 1 forms a desired component. the peak (the part most projected in the direction of a periphery of the semi-conductor wafer 1 --) of said round configuration That is, the longest section of this path direction in a perpendicular cross section is made to exist to the direction of a path of this semi-conductor wafer 1 the lower part [ top face / 2 / of the semi-conductor wafer 1 concerned ], and above the thickness direction core of this semi-conductor wafer 1. For this reason, since the angle which the rear face 3 and periphery edge side face of the semi-conductor wafer 1 form does not turn into an acute angle even if it carries out grinding of the rear face of the semi-conductor wafer 1 concerned until the thickness of the semi-conductor wafer 1 serves as or less 1/2 extent, the semi-conductor wafer 1 after grinding can prevent it getting damaged being missing, or being divided.

[0012] Next, the manufacture approach of the semi-conductor wafer 1 concerning this example is explained with reference to a drawing. Drawing 2 is drawing showing the process which carries out polish processing (rounding-off processing of a periphery edge side face) of the periphery edge side face of the semi-conductor wafer 1 concerning this example. First, after cutting down the semi-conductor wafer 1 with a thickness of 625 micrometers from a semiconducting crystal, using the polish processing equipment 14 shown in drawing 2, the semi-conductor wafer 1 is laid in the predetermined location on

the wafer installation base 5, and polish processing of the periphery edge side face of the semi-conductor wafer 1 concerned is performed, rotating polish processing equipment 14 and the wafer installation base 5.

[0013] This polish processing equipment 14 is conventional polish processing equipment, and exchanges only the polish fixture 4. Said polish fixture 4 is so long that the R of the polished surface goes to the lower part so short that it goes to the upper part, and serves as an unsymmetrical configuration to the center line of the vertical direction. In this example, when polish processing of the semi-conductor wafer 1 was carried out, as 625 micrometers in thickness were shown in drawing 3, the peak of the round configuration of the periphery edge side face of the semi-conductor wafer 1 became the location which fell by 150 micrometers from the top face 2 of this semi-conductor wafer 1, and the polish fixture 4 equipped with the R which can form an unsymmetrical round configuration to the thickness direction center line of the semi-conductor wafer 1 was used. The semi-conductor wafer 1 equipped with the configuration shown in drawing 3 according to this process was manufactured.

[0014] Next, after forming a desired component in the front face of the semi-conductor wafer 1 obtained at the process shown in drawing 2, an assembler does grinding of the rear face of the semi-conductor wafer 1 in front, and makes thin thickness of this semi-conductor wafer 1 to 300 micrometers in front. Here, since the semi-conductor wafer 1 after grinding has the peak of the round configuration of a periphery edge side face in the location which fell by 150 micrometers from the top face 3, it can leave the round configuration of a periphery edge side face, and can use as an obtuse angle the angle which the rear face 3 and periphery edge side face of a semi-conductor wafer form.

[0015] In addition, although this example explained the case where the semi-conductor wafer 1 whose thickness is 625 micrometers was made thin to 300 micrometers, a request may determine the thickness of the semi-conductor wafer 1 not only this but after grinding. Moreover, what is necessary is just to make the peak of not only this but a round configuration exist the lower part [ top face / 2 / of the semi-conductor wafer 1 ], and above the thickness direction core of this semi-conductor wafer 1, although the peak of the round configuration formed in the periphery section side face of the semi-conductor wafer 1 was set as the location which fell by 150 micrometers from the top face 2 in this example.

[0016] And although this example explained the semi-conductor wafer 1 with which the round configuration was formed in the periphery edge side face As shown not only in this but in drawing 4, the periphery edge side face of the semi-conductor wafer 1 To the direction of a path of the semi-conductor wafer 1, the longest section of this path direction in a perpendicular cross section so that it may exist the lower part [ top face / of this semi-conductor wafer 1 ], and above the thickness direction core of this semi-conductor wafer If an acute angle configuration does not exist in said periphery edge side face and beveling asymmetrically to the thickness direction center line concerned etc. fulfills said conditions, a periphery edge side face is good also as other configurations.

[0017]

[Effect of the Invention] As explained above, the semi-conductor wafer concerning this invention Since the longest section of this path direction in a perpendicular cross section exists to the direction of a path the lower part [ top face / of this semi-conductor wafer ], and above the thickness direction core of this semi-conductor wafer, Even if it carries out grinding of the rear face of the semi-conductor wafer concerned and makes thickness of this semi-conductor wafer thin, the longest section of this path direction in a perpendicular cross section can be made to exist in the periphery edge side face of the semi-conductor wafer after grinding to the direction of a path of the semi-conductor wafer in front of said grinding. Therefore, since the angle which the inferior surface of tongue and periphery edge side face of a semi-conductor wafer after grinding form can be used as an obtuse angle, the semi-conductor wafer concerned can prevent contacting various manufacturing installations etc., and getting damaged, or it being missing, or being divided. Consequently, the yield of a product can be improved sharply.

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CLAIMS

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[Claim(s)]

[Claim 1] The semi-conductor wafer characterized by the longest section of this path direction in a perpendicular cross section existing to the direction of a path of said semi-conductor wafer the lower part [ top face / of this semi-conductor wafer ], and above the thickness direction core of this semi-conductor wafer in the semi-conductor wafer for semiconductor devices with which it was started from the semiconducting crystal and polish processing was performed to the side face.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the fragmentary sectional view of the semi-conductor wafer concerning the example of this invention.

[Drawing 2] It is drawing showing the process which carries out polish processing of the periphery edge side face of the semi-conductor wafer 1 concerning this example.

[Drawing 3] It is the fragmentary sectional view of the semi-conductor wafer concerning the example of this invention.

[Drawing 4] It is the fragmentary sectional view of the semi-conductor wafer concerning other examples of this invention.

[Description of Notations]

1 Semi-conductor Wafer

2 Top Face

3 Rear Face

4 Polish Fixture

5 Wafer Installation Base

14 Polish Processing Equipment

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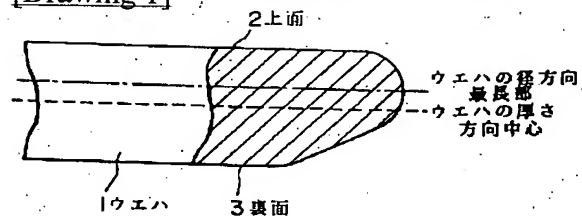
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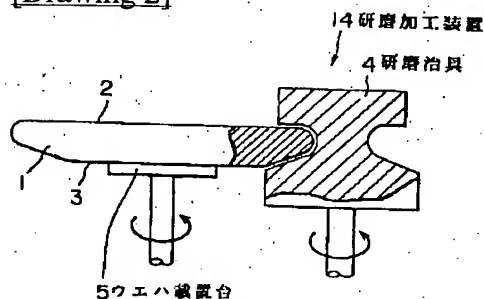
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## DRAWINGS

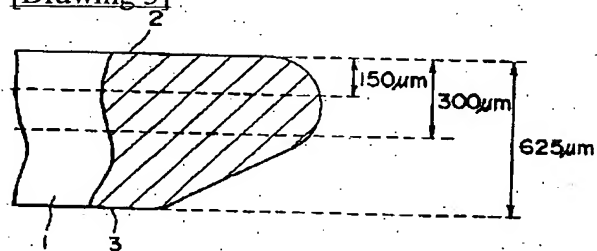
[Drawing 1]



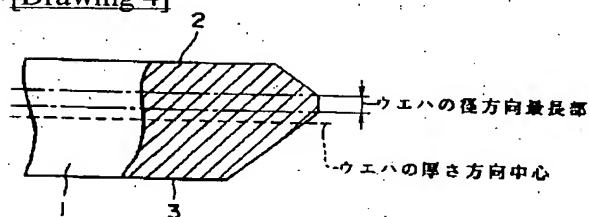
[Drawing 2]



[Drawing 3]



[Drawing 4]



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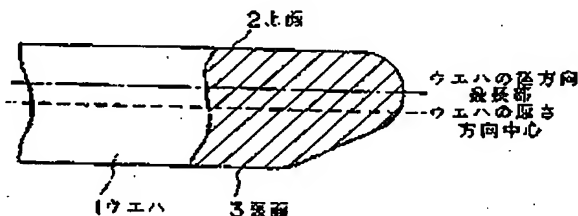
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(54)【発明の名称】 半導体ウエハ

(57)【要約】

【目的】 半導体ウエハの裏面を研削し、該半導体ウエハの厚さを薄くした後の工程において、当該半導体ウエハに傷が付いたり割れが発生したりするのを防止することが可能な半導体ウエハを提供する。

【構成】 半導体ウエハ1の外周端部側面形状を、該半導体ウエハ1の径方向に対して垂直な断面における該径方向の最長部が、該半導体ウエハ1の上面2より下部、且つ該半導体ウエハの厚さ方向中心より上部に存在したラウンド形状あるいはテーバー形状とする。



## 【特許請求の範囲】

【請求項1】 半導体結晶から切り出され、側面に研磨加工が施された半導体デバイス用の半導体ウエハにおいて、

前記半導体ウエハの径方向に対して垂直な断面における該径方向の最長部が、該半導体ウエハの上面より下部、且つ該半導体ウエハの厚さ方向中心より上部に存在することを特徴とする半導体ウエハ。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 本発明は、半導体ウエハに係り、特に、半導体ウエハの裏面を研削し、該半導体ウエハの厚さを薄くした後の工程において、当該半導体ウエハに傷が付いたり割れが発生することを防止した半導体ウエハに関する。

## 【0002】

【従来の技術】 従来から、半導体結晶から切り出した半導体デバイス用の半導体ウエハは、所望の素子を形成する工程で、当該半導体ウエハが種々の製造装置等と接触して傷付いたり、ひびが入ったりすることを防止するために、前記半導体ウエハの径方向に対して垂直な断面の該径方向端部の形状が、当該半導体ウエハの厚さの1/2のアーチ(R)を描いた半円形状(丸くなった形状)となるように、研磨治具により研磨加工(外周端部側面の丸め加工)が施されている。即ち、半導体ウエハの外周端部側面は、該半導体ウエハの厚さ方向中心部が外周方向に向けてピークとなったラウンド形状となっている。

【0003】 近年、半導体装置の微細化及び高集積化と同様に、半導体装置の薄膜化が要求されてきている。この半導体装置の薄膜化を行う方法の一つとして、半導体ウエハの厚さを薄くする方法が一般的に行われている。この方法としては、例えば、半導体ウエハを半導体結晶から切り出す際に、所望の薄い厚さで切り出す方法や、半導体結晶から切り出した半導体デバイス用の半導体ウエハの裏面を研削し、該半導体ウエハを所望の薄い厚さにする方法、あるいは、所望の素子が形成された半導体ウエハの裏面を研削し、該半導体ウエハを所望の薄い厚さにする方法等が挙げられる。

【0004】 しかしながら、前記半導体ウエハを所望の薄い厚さで切り出す方法や、切り出した半導体ウエハの裏面を研削し、該半導体ウエハを所望の薄い厚さにする方法は、後の工程で当該半導体ウエハに所望の素子を形成する際に、該半導体ウエハに反りが生じ易いという問題があった。そこで近年では、所望の素子が形成された組み立て工程前の半導体ウエハの裏面を研削し、該半導体ウエハを所望の薄い厚さにする方法等が一般的に行われている。

【0005】 そして、この半導体ウエハの薄膜化工程では、通常、所望素子を形成した後、組み立て工程前に、

当該半導体ウエハの厚さが1/2以下程度となるまで、該半導体ウエハの裏面の研削が行われている。

## 【0006】

【発明が解決しようとする課題】 しかしながら、前記組み立て工程前に半導体ウエハの裏面を研削して厚さを調整する従来例は、通常、半導体ウエハの厚さが1/2以下程度となるまで研削が行われるため、前記研削前の半導体ウエハの外周端部側面に形成されていたラウンド形状が崩れ、半導体ウエハの下面が、該半導体ウエハの外周端部側面のうち最も外周に向けて突出した形状となる。従って、研削後の半導体ウエハの下面と外周端部側面とが形成する角が鋭角な状態(先端が尖った状態)となるため、後の工程中に、この部分が種々の装置等に接触して傷付いたり、欠けたり、割れたりし易く、歩留りが低下するという問題があった。

【0007】 本発明は、このような従来の問題点を解決することを課題とするものであり、半導体ウエハの裏面を研削し、該半導体ウエハの厚さを薄くした後の工程において、当該半導体ウエハに傷が付いたり割れが発生したりすることを防止することが可能な半導体ウエハを提供することを目的とする。

## 【0008】

【課題を解決するための手段】 この目的を達成するために、本発明は、半導体結晶から切り出され、側面に研磨加工が施された半導体デバイス用の半導体ウエハにおいて、前記半導体ウエハの径方向に対して垂直な断面における該径方向の最長部が、該半導体ウエハの上面より下部、且つ該半導体ウエハの厚さ方向中心より上部に存在することを特徴とする半導体ウエハを提供するものである。

## 【0009】

【作用】 本発明に係る半導体ウエハは、半導体ウエハの径方向に対して垂直な断面における該径方向の最長部が、該半導体ウエハの上面より下部、且つ該半導体ウエハの厚さ方向中心より上部に存在するため、当該半導体ウエハの厚さが1/2以下程度となるまで、該半導体ウエハの裏面を研削しても、研削後の半導体ウエハの外周端部側面に、前記研削前の半導体ウエハの径方向に対して垂直な断面における該径方向の最長部を存在させておくことができる。従って、研削後の半導体ウエハの下面と外周端部側面とが形成する角が鋭角となる(先端の尖った形状)ことがなく、且つ当該外周端部側面に鋭角な形状が形成されることがない。このため、前記半導体ウエハが種々の製造装置等と接触して傷付いたり、欠けたり、割れたりすることを防止することができる。

## 【0010】

【実施例】 次に、本発明に係る実施例について、図面を参照して説明する。図1は、本発明の実施例に係る半導体ウエハの部分断面図である。図1に示す半導体ウエハ1は、後に行う種々の工程において、当該半導体ウエハ

1が製造装置等と接触して傷付いたり、ひびが入ったりすることを防止するために、前記半導体ウエハ1の外周端部側面を丸く加工したラウンド形状を備えている。このラウンド形状は、前記半導体ウエハ1の径方向に対して垂直な断面における該径方向の最長部が、当該半導体ウエハ1の上面2より下部、且つ該半導体ウエハ1の厚さ方向中心より上部に存在し、半導体ウエハ1の厚さ方向中心線に対して非対称な形状を有している。

【0011】この半導体ウエハ1は、所望の素子を形成した後に、当該半導体ウエハ1の裏面を研削し、該半導体ウエハ1の厚さを1/2以下程度まで薄くすることを想定して、前記ラウンド形状のピーク（半導体ウエハ1の外周方向に最も突出した部分、即ち、該半導体ウエハ1の径方向に対して垂直な断面における該径方向の最長部）を、当該半導体ウエハ1の上面2より下部、且つ該半導体ウエハ1の厚さ方向中心より上部に存在させている。このため、半導体ウエハ1の厚さが1/2以下程度となるまで当該半導体ウエハ1の裏面を研削しても、半導体ウエハ1の裏面3と外周端部側面とが形成する角が鋭角となることがないため、研削後の半導体ウエハ1が傷付いたり、欠けたり、割れたりすることを防止することができる。

【0012】次に、本実施例に係る半導体ウエハ1の製造方法について図面を参照して説明する。図2は、本実施例に係る半導体ウエハ1の外周端部側面を研削加工（外周端部側面の丸め加工）する工程を示す図である。まず、半導体結晶から625 $\mu$ mの厚さの半導体ウエハ1を切り出した後、図2に示す研削加工装置14を用い、半導体ウエハ1をウエハ載置台5上の所定位置に載置し、研削加工装置14及びウエハ載置台5を回転させながら当該半導体ウエハ1の外周端部側面の研削加工を行う。

【0013】この研削加工装置14は、従来の研削加工装置であって、研削治具4のみを取り替えたものである。前記研削治具4は、その研削面のアールが、上部に行くほど短く下部に行くほど長く、上下方向の中心線に対して非対称な形状となっている。本実施例では、厚さ625 $\mu$ mを半導体ウエハ1を研削加工した際に、図3に示すように、半導体ウエハ1の外周端部側面のラウンド形状のピークが該半導体ウエハ1の上面2から150 $\mu$ m下がった位置となり、半導体ウエハ1の厚さ方向中心線に対して非対称なラウンド形状を形成することが可能なアールを備えた研削治具4を使用した。この工程により、図3に示す形状を備えた半導体ウエハ1を製造した。

【0014】次に、図2に示す工程で得た半導体ウエハ1の表面に、所望の素子を形成した後、組み立て工程前に、半導体ウエハ1の裏面を研削し、該半導体ウエハ1の厚さを300 $\mu$ mまで薄くする。ここで、研削後の半導体ウエハ1は、外周端部側面のラウンド形状のピーク

が上面3から150 $\mu$ m下がった位置にあるため、外周端部側面のラウンド形状を残すことができ、半導体ウエハの裏面3と外周端部側面とが形成する角を鈍角にすることができる。

【0015】なお、本実施例では、厚さが625 $\mu$ mの半導体ウエハ1を300 $\mu$ mまで薄くする場合について説明したが、これに限らず、研削後の半導体ウエハ1の厚さは、所望により決定してよい。また、本実施例では、半導体ウエハ1の外周端部側面に形成したラウンド形状のピークを上面2から150 $\mu$ m下がった位置に設定したが、これに限らず、ラウンド形状のピークは、半導体ウエハ1の上面2より下部、且つ該半導体ウエハ1の厚さ方向中心より上部に存在させればよい。

【0016】そして、本実施例では、外周端部側面にラウンド形状が形成された半導体ウエハ1について説明したが、これに限らず、例えば、図4に示すように、半導体ウエハ1の外周端部側面を、半導体ウエハ1の径方向に対して垂直な断面における該径方向の最長部が、該半導体ウエハ1の上面より下部、且つ該半導体ウエハ1の厚さ方向中心より上部に存在するように、当該厚さ方向中心線に対して非対称に面取りする等、前記外周端部側面に鋭角な形状が存在せず且つ前記条件を満たせば、外周端部側面は他の形状としてもよい。

【0017】

【発明の効果】以上説明したように、本発明に係る半導体ウエハは、径方向に対して垂直な断面における該径方向の最長部が、該半導体ウエハの上面より下部、且つ該半導体ウエハの厚さ方向中心より上部に存在するため、当該半導体ウエハの裏面を研削して該半導体ウエハの厚さを薄くしても、研削後の半導体ウエハの外周端部側面に、前記研削前の半導体ウエハの径方向に対して垂直な断面における該径方向の最長部を存在させておくことができる。従って、研削後の半導体ウエハの下面と外周端部側面とが形成する角を鈍角にすることができるため、当該半導体ウエハが種々の製造装置等と接触して傷付いたり、欠けたり、割れたりすることを防止することができる。この結果、製品の歩留りを大幅に向上することができる。

【図面の簡単な説明】

【図1】本発明の実施例に係る半導体ウエハの部分断面図である。

【図2】本実施例に係る半導体ウエハ1の外周端部側面を研削加工する工程を示す図である。

【図3】本発明の実施例に係る半導体ウエハの部分断面図である。

【図4】本発明の他の実施例に係る半導体ウエハの部分断面図である。

【符号の説明】

- 1 半導体ウエハ
- 2 上面

(4)

特開平6-314676

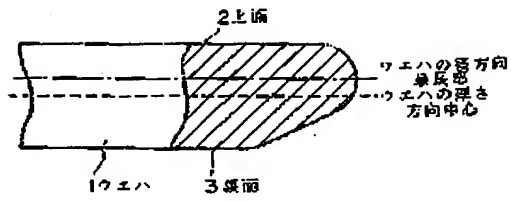
- 3 裏面  
4 研磨治具

5

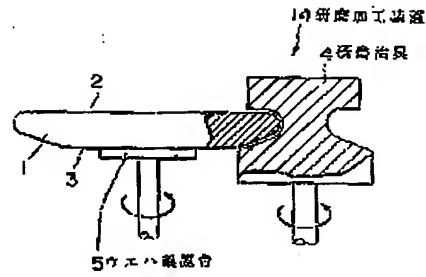
- \* 5 ウエハ載置台  
\* 14 研磨加工装置

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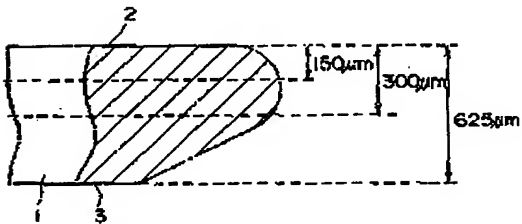
【図1】



【図2】



【図3】



【図4】

